PATENT ABSTRACTS OF JAPAN

(11)Publication number : 07-136119
(43)Date of publication of application : 30.05.1995

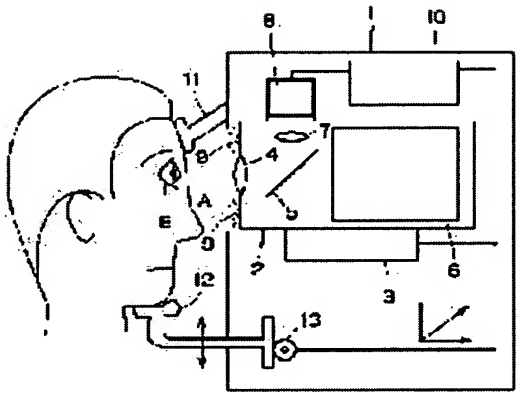
(51)Int.CI. A61B 3/10

(21)Application number : 05-314242
(22)Date of filing : 19.11.1993

(71)Applicant : CANON INC
(72)Inventor : KOBAYAKAWA YOSHI

(54) OPHTHALMOLOGIC APPARATUS

(57)Abstract:
PURPOSE: To achieve a fully automatic optometric operation by performing a positioning between an eye to be inspected and the apparatus automatically.
CONSTITUTION: A reflected luminous flux from an anterior ocular segment with a lighting source 90 passes through an objective lens 4 to form an image on a TV camera 8. At this point. a reflection image of cornea is extracted to determine a deviation of an eye E to be inspected from an optical axis A. Based on the results, a stepping motor 13 of a jaw receiving base 12 and a drive section thereof 3 are driven by a control section 10 to perform a positioning.



LEGAL STATUS

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[Date of final disposal for application]	
[Patent number]	3431969
[Date of registration]	23.05.2003
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[Date of extinction of right]	

(19)日本国特許庁（ＪＰ）　(12) 公開特許公報（A）　(11)特許出願公開番号

特開平7－136119

(43)公開日　平成７年(1995)５月30日

(51)Int.Cl.[6]	識別記号	庁内整理番号	ＦＩ	技術表示箇所
Ａ６１Ｂ　3/10				
			Ａ６１Ｂ　3/ 10　W	

審査請求　未請求　請求項の数２　ＦＤ　（全　４　頁）

(21)出願番号　特願平5－314242

(22)出願日　平成５年(1993)11月19日

(71)出願人　000001007
キヤノン株式会社
東京都大田区下丸子３丁目30番２号

(72)発明者　小早川　嘉
神奈川県川崎市中原区今井上町53番地　キヤノン株式会社小杉事業所内

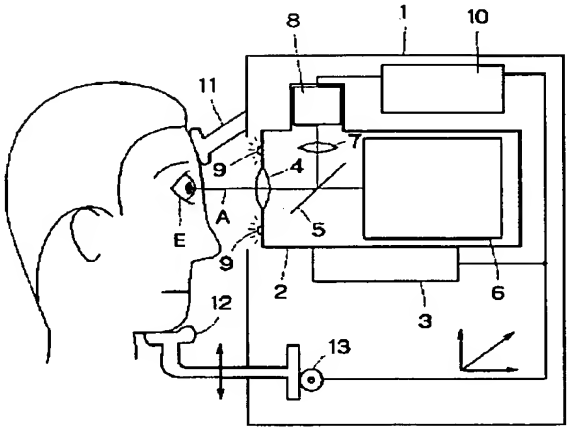
(74)代理人　弁理士　日比谷　征彦

(54)【発明の名称】　眼科装置

(57)【要約】

【目的】　被検眼と装置との位置合わせを自動で行い、全自動の検眼操作を行う。

【構成】　前眼部からの照明光源９による反射光束は、対物レンズ４を通りテレビカメラ８に結像する。このとき、角膜反射像を抽出し、光軸Ａに対する被検眼Ｅのずれを求める。この結果に基づいて、顎受け台１２のステッピングモータ１３及び駆動部３を制御部１０により駆動して、位置合わせを行う。



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【特許請求の範囲】

【請求項１】　被検者の顔部を固定する顔固定手段と、前眼部照明光源と、前眼部撮像テレビ系及び検眼光学系から成る検眼部とを備えた眼科装置において、該検眼部を駆動する駆動手段を設け、該駆動手段を前記撮像テレビ系の信号に基づいて制御する制御手段を有することを特徴とする眼科装置。

【請求項２】　前記顔固定手段に顎受け台を移動する移動手段を設け、前記制御手段は前記移動手段を前記駆動手段と共に前記撮像テレビ系の信号に基づいて制御するようにした請求項１に記載の眼科装置。

【発明の詳細な説明】

【０００１】

【産業上の利用分野】本発明は、眼科医院や眼鏡店で検眼装置として使用される眼科装置に関するものである。

【０００２】

【従来の技術】従来、オートレフラクトメータ、ケラトメータ、トノメータ、眼底カメラ等の眼科装置の位置合わせは、被検者の頭部を額当て、顎受け台に固定し、検者が検眼光学系を載せた摺動台を操作桿により移動し、被検者の眼の位置と光軸とを合せて行っている。しかし、検者が被検者の前眼部を観察しながら正確な位置合わせを行うのは時間が掛かり、被検者の疲労の原因にもなる。このため、検者が操作桿により或る程度位置合わせをしてから、自動的に位置合わせを行う装置が工夫されている。

【０００３】

【発明が解決しようとする課題】しかしながら、上述の従来例のような自動的位置合わせでは、検者が常時監視していなければ正確な位置合わせが難しく、特に顎受け台の高さの調節は被検者の前眼部を観察しながら検者が手動で行っているのが現状である。

【０００４】本発明の目的は、上述の問題点を解消し、被検眼と装置との位置合わせを自動的に行い得る眼科装置を提供することにある。

【０００５】

【課題を解決するための手段】上記目的を達成するための本発明に係る眼科装置は、被検者の顔部を固定する顔固定手段と、前眼部照明光源と、前眼部撮像テレビ系及び検眼光学系から成る検眼部とを備えた眼科装置において、該検眼部を駆動する駆動手段を設け、該駆動手段を前記撮像テレビ系の信号に基づいて制御する制御手段を有することを特徴とする。

【０００６】

【作用】上述の構成を有する眼科装置は、前眼部を照明光源により照明し、前眼部像をテレビカメラで撮像し、この信号を制御手段に入力し、この制御手段からの出力に基づいて検眼部を駆動して、被検眼と検眼光学系の位置合わせを行う。

【０００７】

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【実施例】本発明を図示の実施例に基づいて詳細に説明する。図１は第１の実施例の構成図を示し、筐体１内の中央付近の被検眼Ｅの前方には、検眼部２が設けられ、この検眼部２の下部には検眼部２を三次元的に移動させる駆動部３が取り付けられている。検眼部２の被検眼Ｅの前方の光軸Ａ方向には、対物レンズ４、ダイクロイックミラー５、検眼光学系６が配置され、ダイクロイックミラー５の反射方向には、結像レンズ７を介してテレビカメラ８が配置されている。また、対物レンズ４の周辺には被検眼Ｅの前眼部及びその周辺を照明する照明光源９が設けられている。この照明光源９は図では光軸Ａの上下方向に描かれているが、実際には対物レンズ４の左右方向に設けられている。

【０００８】テレビカメラ８の出力は筐体１内に設けられたコンピュータなどを含む制御部１０に接続されている。更に、筐体１の上部には額当て１１が取り付けられ、筐体１の下部には顎受け台１２が取り付けられ、顎受け台１２には顎受け台１２を上下方向に移動するためのステッピングモータ１３が連結されている。更に、制御部１０の出力はステッピングモータ１３と駆動部３に接続されている。

【０００９】上述の構成において、照明光源９により照明された被検眼Ｅの前眼部からの反射光は、対物レンズ４を通りダイクロイックミラー５で反射し、結像レンズ７を介してテレビカメラ８に前眼部像として結像する。一方、検眼光学系６からの検眼用光束は、ダイクロイックミラー５を透過し、対物レンズ４を通って被検眼Ｅに至る。

【００１０】図２はテレビカメラ８に移った被検眼Ｅの前眼部像Ｅ’を示している。この像Ｅ’には照明光源９の角膜反射像９’も映っている。顔の大きさには個人差があり、上下方向には調節範囲を大きくとる必要があり、図２に示すように画面を縦に使って被検眼像Ｅ’が画面から外れないようにすることが好ましい。また、位置の粗調節は初めは顎受け台１２の上下で行い、或る程度上下が合ってから駆動部３を駆動させて前後上下左右を正確に合わせる。光軸Ａの前後方向の調節は角膜反射像９’のぼけ状態で行い、ぼけない位置で光軸Ａの中心に反射像９’の中心がくるように駆動部３を移動する。

【００１１】角膜の鏡面反射は、他の部位からの反射に比べて強度が非常に強い。従って、所定の閾値を決めてこの角膜反射像９’のみを図３に示すように抽出することができる。図３の位置を基に画像信号として制御部１０のコンピュータに入力して演算を行い、光学系の光軸Ａに対する被検眼Ｅのずれを判定する。この計算結果に基づいて、顎受け台１２のステッピングモータ１３及び検眼部２の三次元駆動部３を駆動して、被検眼Ｅが検眼部２に対し所定位置になるようにアライメントを行う。

【００１２】なお、テレビカメラ８で受光した像をテレビモニタ等に表示し、テレビモニタ像を観察しながら調

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節を行ってもよい。この方法であれば、瞼がかぶさったりした場合などは手で瞼を開けるなどの適切な処置を行うことができるし、位置合わせが確実であるかどうかなどの監視を行うこともできる。

【００１３】照明光源９を光軸の左右に２個設けることにより、角膜反射像が２個発生して１個の場合より正確な認識ができ、ほぼ一定間隔にほぼ同一光量の像を発生させることができ、他の反射光との識別が容易である。

【００１４】図４は第２の実施例の構成図であり、図１と同じ符号は同じ部材を示している。この第２の実施例では顎受け台１２は使用せず、筐体１の上部に取り付けられた額当て１４がステッピングモータ１５と連結され、光軸Ａ方向に移動可能とされている。また、前眼部を照明する照明光源１６は筐体１に取り付けられており、他の構成は第１の実施例と同様である。

【００１５】この場合に、額当て１４をステッピングモータ１５により駆動し、被検眼Ｅの前方の光軸Ａ方向の位置調整を行う。被検眼Ｅの前眼部を照明光源１６により照明し、第１の実施例と同様の操作を行う。

【００１６】図５はテレビカメラ８に映った被検眼像Ｅ’を示し、本実施例では角膜反射像ではなく瞳孔像Ｅｐ’を抽出し、図６は抽出された瞳孔像Ｅｐ’を示している。光軸Ａと瞳孔像Ｅｐ’との位置関係からアライメントを知ることができ、瞳孔像Ｅｐ’の中心が光軸Ａに合致するように、駆動部３を駆動して検眼部２の位置を調節する。

【００１７】被検眼Ｅに対して斜め方向から照明光源１６による照明をした場合は、眼底からの反射の発生はないので、瞳孔Ｅｐ内は他の前眼部に比べて暗くなりビデオ信号のレベルが低くなるので、制御部１０による検出が

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可能となる。瞳孔像Ｅｐ’は一定範囲の大きさを有する円形なので、コンピューターで認識する上で分かり易い。

【００１８】第１の実施例と同様に瞳孔像Ｅｐ’の像のぼけの状態で、光軸Ａ方向の位置が合っているか分かるので、ぼけのない個所まで検眼部２を駆動させればよい。なお、駆動に必要な距離が大きい場合には額当て１４を先に駆動させるとよい。

【００１９】

【発明の効果】以上説明したように本発明に係る眼科装置は、前眼部像の受光信号に基づいて検眼部を駆動し、被検眼と検眼光学系の位置合わせを自動的に行うので、検者は位置合わせ操作から開放され、被検眼によらない自動的な位置合わせができ、全自動検眼が可能となる。

【図面の簡単な説明】

【図１】第１実施例の構成図である。

【図２】前眼部像の説明図である。

【図３】角膜反射像の説明図である。

【図４】第２実施例の構成図である。

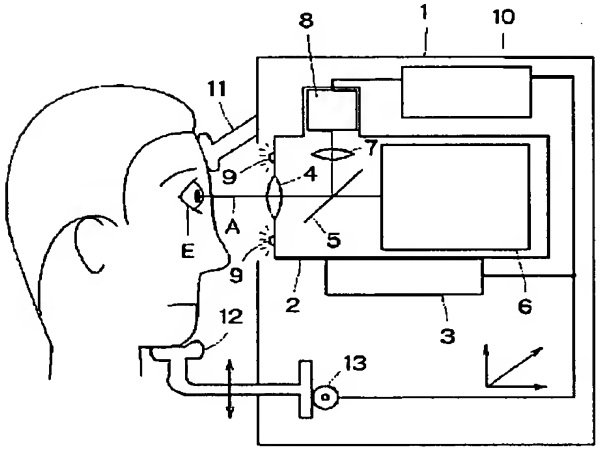
【図５】前眼部像の説明図である。

【図６】瞳孔像の説明図である。

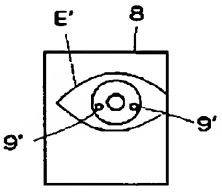
【符号の説明】

１　筐体
２　検眼部
３　駆動部
６　検眼光学系
８　テレビカメラ
１０　制御部
１１、１４　額当て
１２　顎受け台
１３、１５　ステッピングモータ

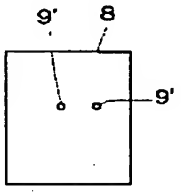
【図１】



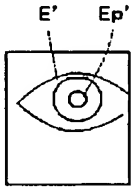
【図２】



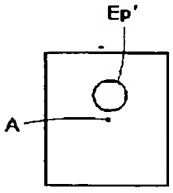
【図３】



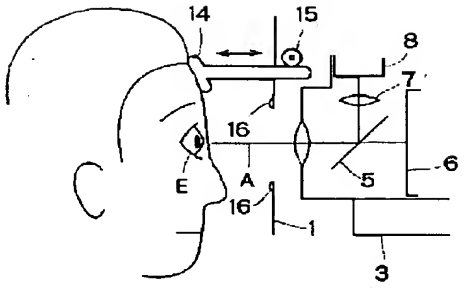
【図５】



【図６】



【図４】



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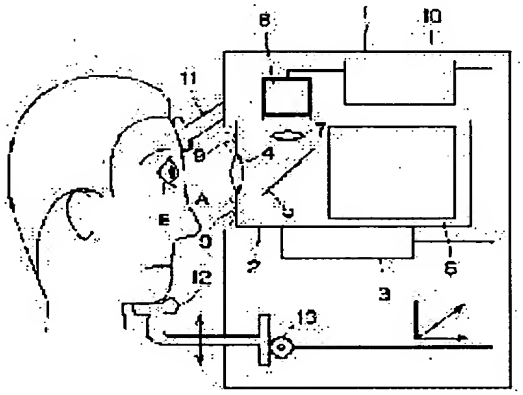

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* NOTICES *

1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

CLAIMS

[Claim(s)]
[Claim 1] Ophthalmology equipment characterized by having the control means which prepare the driving means which drive this optometry section in ophthalmology equipment equipped with a face fixed means to fix the face section of the subject, the anterior eye segment lighting light source, and the optometry section that consists of an anterior eye segment image pck-up television system and optometry optical system, and control these driving means based on the signal of the aforementioned image pck-up television system.
[Claim 2] It is ophthalmology equipment according to claim 1 with which a move means to move a jaw cradle to the aforementioned face fixed means is established, and the aforementioned control means controlled the aforementioned move means based on the signal of the aforementioned image pck-up television system with the aforementioned driving means.

[Translation done.]

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Industrial Application] this invention relates to the ophthalmology equipment used as eye examination equipment in an ophthalmology hospital or a glasses store.
[0002]
[Description of the Prior Art] Conventionally, the alignment of ophthalmology equipments, such as auto reflex RAKUTO meter, KERATO meter, TONOMETA, and a fundus camera, fixes a **-ed person's head to frame reliance and a jaw cradle, moves by the operating lever in the sliding base on which the ** person put eye examination optical system, doubles the position and optical axis of an eye of a **-ed person, and is performing them. However, while a ** person observes a **-ed person's anterior eye segment, performing exact alignment requires time and it causes fatigue of a **-ed person. For this reason, after a ** person does alignment a certain grade by the operating lever, the equipment which performs alignment automatically is devised.
[0003]
[Problem(s) to be Solved by the Invention] However, in automatic alignment like the above-mentioned conventional example, if the ** person is not monitoring continuously, exact alignment is difficult, and the present condition is that the ** person is performing especially regulation of the height of a jaw cradle manually, observing a **-ed person's anterior eye segment.
[0004] The purpose of this invention cancels an above-mentioned trouble, and is to offer the ophthalmology equipment which can perform alignment of an eye examination-ed and equipment automatically.
[0005]
[Means for Solving the Problem] The ophthalmology equipment concerning this invention for attaining the above-mentioned purpose prepares the driving means which drive this eye examination section, and is characterized by to have the control means which control these driving means based on the signal of the aforementioned image pck-up television system in ophthalmology equipment equipped with a face fixed means fix a **-ed person's face section, the anterior eye segment lighting light source, and the eye examination section that consists of an anterior eye segment image pck-up television system and eye examination optical system.
[0006]
[Function] The ophthalmology equipment which has above-mentioned composition illuminates an anterior eye segment with the lighting light source, picturizes an anterior eye segment image with a television camera, inputs this signal into control means, drives the eye examination section based on the output from these control means, and performs alignment of an eye examination-ed and eye examination optical system.
[0007]
[Example] this invention is explained in detail based on the example of illustration. Drawing 1 shows the block diagram of the 1st example, ahead [examined / E / the eyes near the center in a case 1] the eye examination section 2 is formed, and the mechanical component 3 to which the eye examination section 2 is moved in three dimensions is attached in the lower part of this eye examination section 2. In the direction of optical-axis A of the front examined [of the eye examination section 2 / E] the eyes, an objective lens 4, a dichroic mirror 5, and the eye examination optical system 6 are arranged, and the television camera 8 is arranged through the image formation lens 7 in the reflective direction of a dichroic mirror 5. Moreover, the lighting light source 9 which illuminates the anterior eye segment examined [E] the eyes and its circumference is formed around the objective lens 4. Although this lighting light source 9 is drawn in the vertical direction of an optical axis A drawing, it is prepared in the longitudinal direction of an objective lens 4 in fact.
[0008] The output of a television camera 8 is connected to the control section 10 containing the computer formed in the case 1. Furthermore, the frame reliance 11 is attached in the upper part of a case 1, the jaw cradle 12 is attached in the lower part of a case 1, and the stepping motor 13 for moving the jaw cradle 12 in the vertical direction is connected with the jaw cradle 12. Furthermore, the output of a control section 10 is connected to the stepping motor 13 and the mechanical component 3.
[0009] In above-mentioned composition, it reflects with a dichroic mirror 5 through an objective lens 4, and image formation of the reflected light from the anterior eye segment examined [which was illuminated with the lighting light source 9 / E] the eyes is carried out to a television camera 8 as an anterior eye segment image through the image formation lens 7. On the other hand, the flux of light for an eye examination from the eye examination optical system 6 penetrates a dichroic mirror 5, and results in the eye examination E-ed through an objective lens 4.
[0010] Drawing 2 shows anterior eye segment image E' examined [from which it moved to the television camera 8 / E] the eyes. Cornea reflected image 9' of the lighting light source 9 is also reflected in this image E'. It is desirable to make it examined the eyes image E' not separate from a screen from a screen using length, as there is individual difference in the size of a face, it is necessary to take the large region of accommodation in the vertical direction and it is shown in drawing 2 . Moreover, after it performs the coarse control paragraph of a position by the upper and lower sides of the jaw cradle 12 and the upper and lower sides suit it a certain grade in the beginning, it makes a mechanical component 3 drive and doubles order four directions correctly. A mechanical component 3 is moved so that regulation of the cross direction of an optical axis A may be performed in the state of dotage of cornea reflected image 9' and the center of reflected image 9' may come to the center of an optical axis A in the position not fading.
[0011] The specular reflection of a cornea has very strong intensity compared with the reflection from other parts. Therefore, only this cornea reflected image 9' can be extracted, as a predetermined threshold is decided and it is shown in drawing 3 . It

calculates by inputting into the computer of a control section 10 as a picture signal based on the position of drawing 3 , and a gap examined [E] the eyes to the optical axis A of optical system is judged. Based on this calculation result, the stepping motor 13 of the jaw cradle 12 and the three-dimensions mechanical component 3 of the eye examination section 2 are driven, and alignment is performed so that the eye examination E-ed may become a predetermined position to the eye examination section 2.
[0012] In addition, the image which received light with the television camera 8 is displayed on a television monitor etc., and you may adjust, observing a television monitor image. When it was this method and an eyelid hangs, suitable disposal, such as opening an eyelid by hand, can be performed, and it can also supervise whether alignment is trustworthy.
[0013] By forming the lighting light source 9 in two right and left of an optical axis, two cornea reflected images occur, recognition more exact than one case can be performed, a fixed interval can be made to generate the image of the same quantity of light mostly, and discernment from other reflected lights is easy.
[0014] Drawing 4 is the block diagram of the 2nd example, and the same sign as drawing 1 shows the same member. In this 2nd example, the jaw cradle 12 is not used, but the frame reliance 14 attached in the upper part of a case 1 is connected with a stepping motor 15, and movement of it in the direction of optical-axis A is enabled. Moreover, the lighting light source 16 which illuminates an anterior eye segment is attached in the case 1, and that of other composition is the same as that of the 1st example.
[0015] In this case, the frame reliance 14 is driven with a stepping motor 15, and positioning of the direction of optical-axis A of the front examined [E] the eyes is performed. The anterior eye segment examined [E] the eyes is illuminated with the lighting light source 16, and the same operation as the 1st example is performed.
[0016] Drawing 5 shows examined the eyes image E' reflected in the television camera 8, and is pupil image Ep[not a cornea reflected image but]' at this example. It is pupil image Ep' from which it extracted and drawing 6 was extracted. It is shown. Alignment can be known from the physical relationship of an optical axis A and pupil image Ep', and it is pupil image Ep'. A mechanical component 3 is driven and the position of the eye examination section 2 is adjusted so that a center may agree in an optical axis A.
[0017] Since the inside of Pupil Ep becomes dark compared with other anterior eye segments since there is no generating of the reflection from the fundus of the eye and the level of a video signal becomes low when lighting by the lighting light source 16 is carried out from across to the eye examination E-ed, it becomes detectable according to a control section 10. Pupil image Ep' It is intelligible, when recognizing by computer, since it is the round shape which has the size of the fixed range.
[0018] It is pupil image Ep' like the 1st example. What is necessary is just to make the eye examination section 2 drive to a part without dotage, since it turns out whether the position of the direction of optical-axis A is correct in the state of dotage of an image. In addition, when a distance required for a drive is large, it is good to make the frame reliance 14 drive previously.
[0019]
[Effect of the Invention] Since the ophthalmology equipment applied to this invention as explained above drives the eye examination section based on the light-receiving signal of an anterior eye segment image and alignment of an eye examination-ed and eye examination optical system is performed automatically, a ** person is wide opened from alignment operation, and gets automatic alignment by eye examination-ed, and the full automatic eye examination of him is attained.

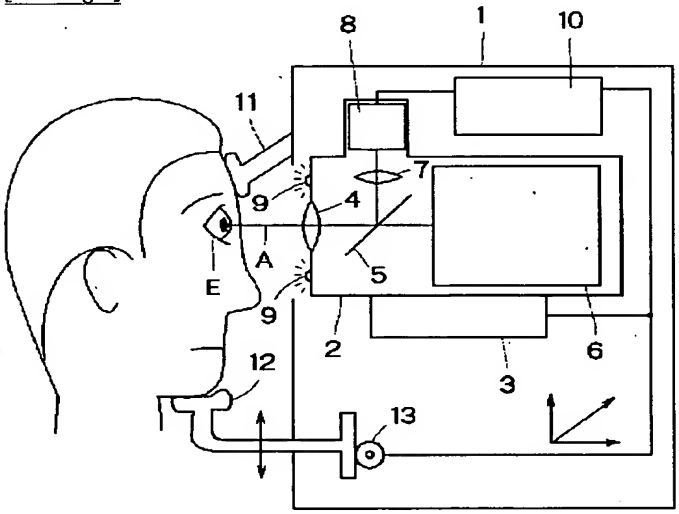
[Translation done.]

* NOTICES *

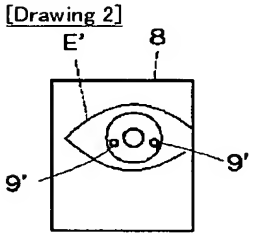
1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

DRAWINGS

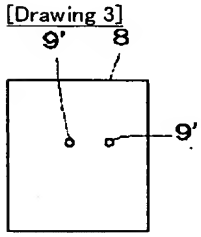
[Drawing 1]



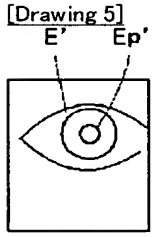
[Drawing 2]



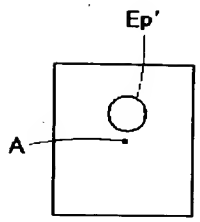
[Drawing 3]



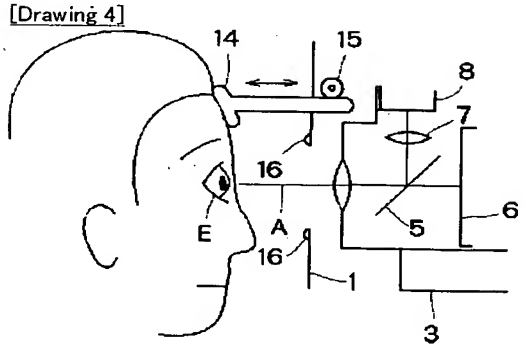
[Drawing 5]



[Drawing 6]



[Drawing 4]



[Translation done.]